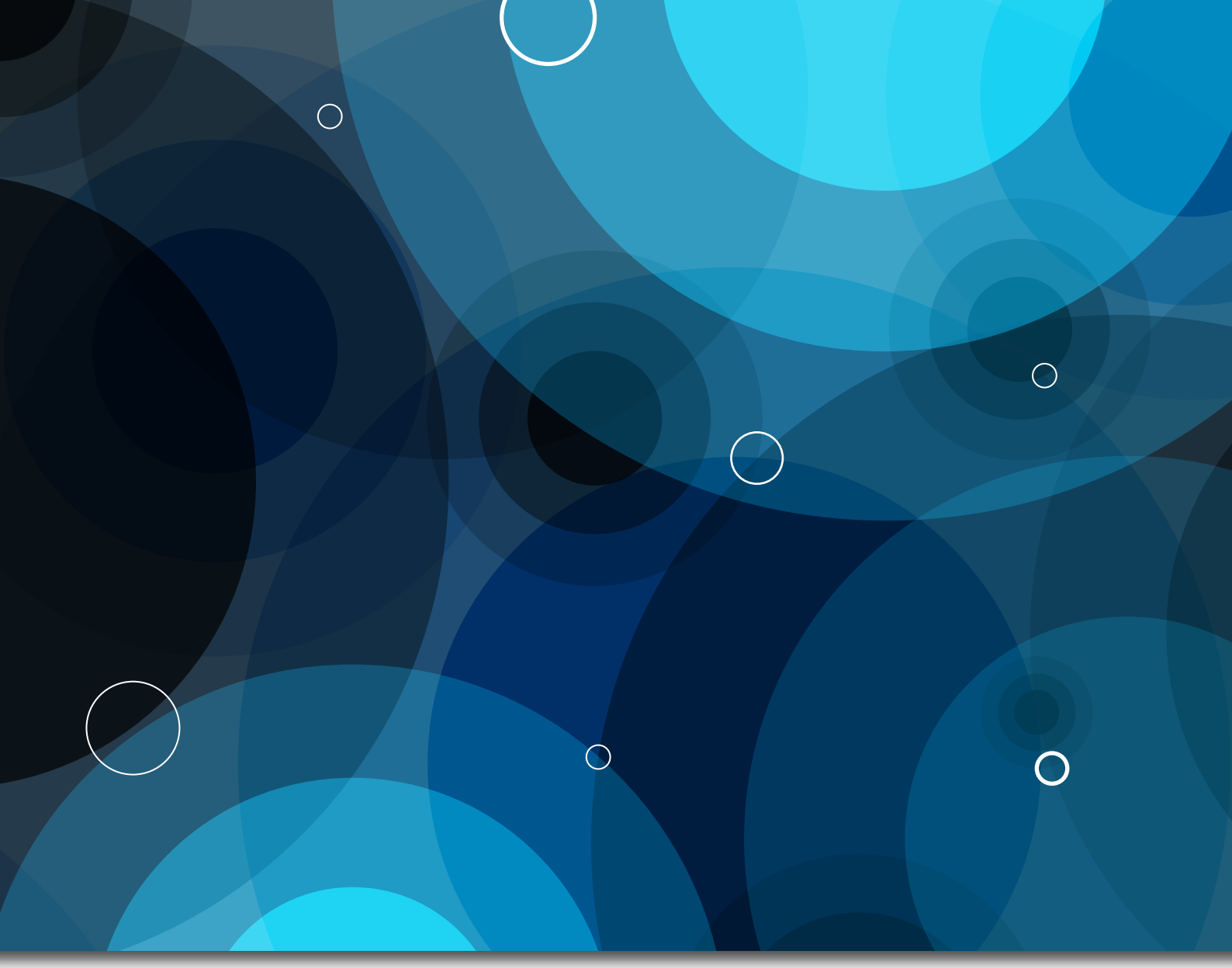


The **Point**® system
Better well integrity

Archer

The **Point®** system
Protect your investment

Now more than ever, well integrity is a global concern. Figures highlight that integrity failures affect at least 40% of wells worldwide. Losing integrity can endanger lives, pollute the environment, and ruin reputations. Production is also affected. Restoring integrity can mitigate these risks, improve production and deliver better returns.

The increasing number of ageing wells, pressure to extend asset life, the rising cost and complexity of wells drilled in exposed environments, stricter industry regulations and a growing media spotlight, are just some of the challenges that operators face in securing the integrity and performance of their assets across the globe.

4,000
integrity-related deployments worldwide

During the last 20 years, Archer has pioneered a remarkable array of technology and systems aimed directly at improving the integrity of our clients' wells. And our front-line experience in over 4,000 integrity-related deployments means that we can confidently claim to be a leader in this domain. Revealing the precise location of integrity failures in wells is one of our foremost specialisations.

Better data, better decisions

Powerful integrity diagnostics begins with knowing that a failure has occurred, then finding it efficiently, accurately and completely. Only then can effective decisions and remedial action be taken. Conventional techniques provide clues, but operators need to know that their interventions will produce reliable and unambiguous answers that enable critical decisions to be made with confidence and precision.

The Point® system from Archer satisfies this need. The result of our passion for innovation and integrity technology, the Point system is an industry icon. Deployed proactively and systematically at surface and downhole, it combines conventional and unique measurements with expert assessment and analysis to evaluate barrier performance and expose the precise location of leaks and flowpaths throughout the well system — without pulling the completion string. Underpinning the Point system is our deep understanding of integrity dynamics, built over decades of diagnosing integrity failures globally.

Better wells, better outcomes

The Point system provides operators with greater confidence — in the reliability of the technology they are using, in the quality and clarity of the data it delivers, and in reaching better decisions on remediation more quickly. The outcome is a considerable reduction of integrity risk, earlier restoration of well productivity and significantly improved profitability.

The **Point**® system
Proactive integrity management

Proactively monitoring the ongoing integrity status of your wells and being able to diagnose an integrity failure quickly, accurately and completely, ensures safe, reliable and productive operations, while keeping interventions and costs to a minimum.

Combining a suite of well-diagnostic technologies and protocols with the knowledge and expertise of our well-integrity specialists, the Point system makes it possible to validate the integrity status of wells and locate failures when they occur.

The Point system has already been proven in over 2,000 successful operations worldwide — and our Point engineers and analysts work with you at every stage to design, deploy and evaluate the most effective diagnostic surveys for your wells.

Introducing integrity dynamics

Locating integrity failures demands a deep understanding of how a well system behaves in response to its integrity — we call this behaviour *integrity dynamics*. The relevance, clarity and resolution of Point data, combined with the expertise and experience of our engineers and analysts, gives you the most direct and comprehensive insight into integrity dynamics available in the industry today.

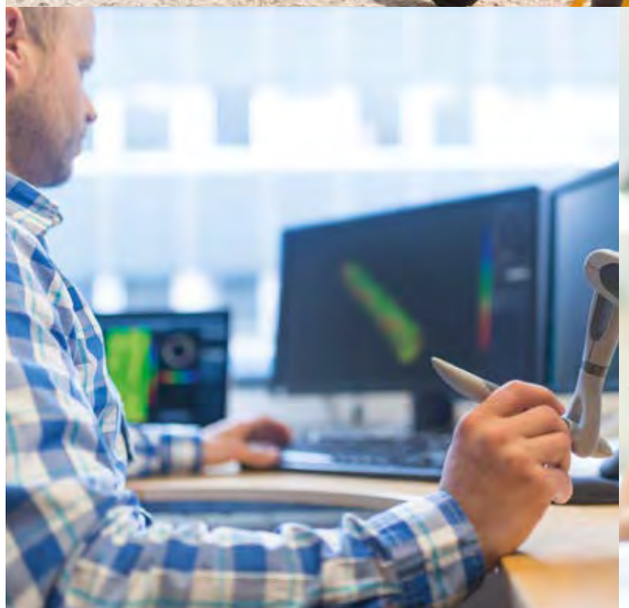
Evaluating barrier performance

Well integrity depends on both the condition *and* sealing performance of well barriers — integrity is lost when a barrier is breached. Routinely monitoring condition and performance provides the most secure approach to integrity management. Point's proven ability to provide a direct indication of barrier failure makes it an indispensable resource for any integrity management program.

Complete confidence

With Point, the integrity status of your wells is revealed efficiently, accurately, clearly and completely, with minimal interruption to production and daily operations — enabling you to make better informed decisions and target remediation with complete confidence.

The most complete insight into integrity dynamics available



The **Point**® system
A systematic approach

The Point system includes seven powerful diagnostic programs that enable a proactive and systematic approach to integrity management.

Check**Point**®
Investigate barrier leaks and flowpaths from surface

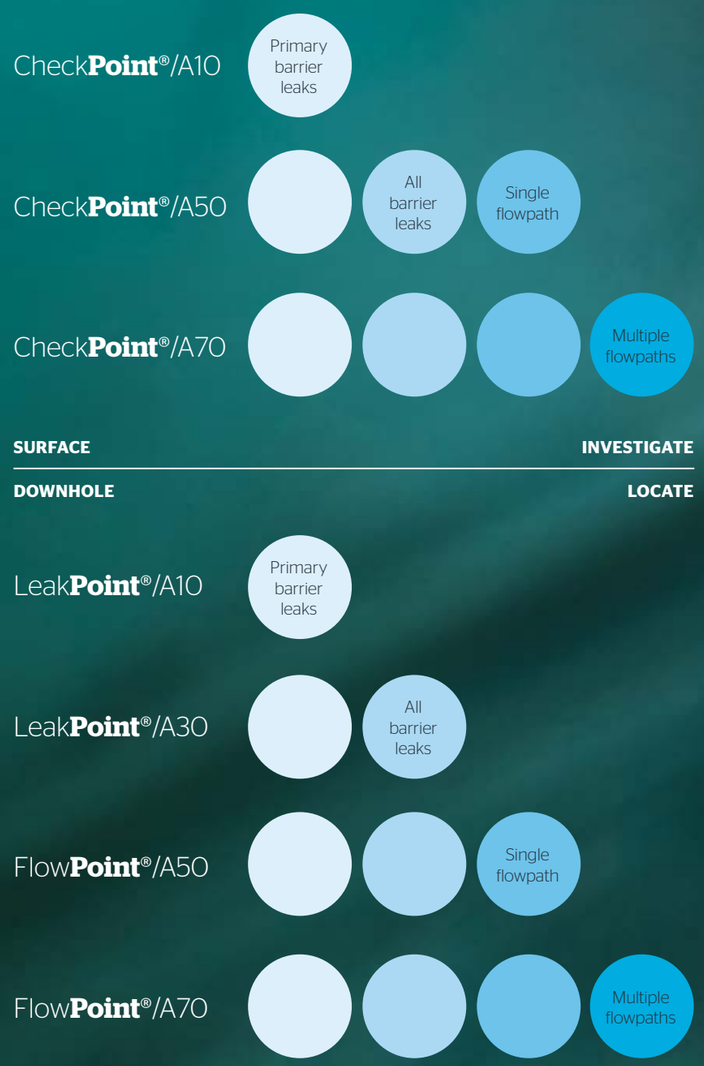
Deployed at surface routinely to validate integrity, or to investigate a known integrity issue, CheckPoint protocols reveal detailed clues about the nature of any failure and its location in the well—enabling operators to develop a targeted plan for further action.

Leak**Point**®
Locate barrier leaks downhole

LeakPoint takes CheckPoint one potent step further—downhole to locate barrier leaks rapidly, accurately and completely. The remarkable clarity and simplicity of LeakPoint data underpins confident remediation decisions, implemented with precision.

Flow**Point**®
Locate barrier leaks and flowpaths downhole

FlowPoint multiplies the power of LeakPoint to locate barrier leaks *and* flowpaths—diagnosing the most complex failure scenarios efficiently and comprehensively. The forensic understanding delivered enables incisive decisions for the most challenging wells.



Six key ingredients that put the Point system in a class of its own and define a new industry standard of integrity management.

Proactive and systematic

Conventional integrity diagnostics can be reactive. Deployed routinely as part of an integrity management program, or to investigate a known integrity issue, Point enables a proactive and systematic approach to integrity management. This mitigates the risk of costly surprises and ensures failures are located rapidly and completely.

Understand integrity dynamics

Diagnosing integrity properly demands a new understanding of well behaviour. Integrity dynamics is what we call the behaviour of the well system in response to its integrity. Point embodies our extensive knowledge of integrity dynamics to precisely locate leaks and flowpaths throughout the well system.

Evaluate barrier performance

Popular integrity surveys evaluate the physical condition of barriers—the Point system evaluates their sealing performance. Barrier condition does not provide a direct indication of integrity loss—Point does. Combining both provides the most secure and comprehensive approach to integrity management.

Surface and downhole screening

Traditional integrity logging is focused downhole. The Point system works at surface and downhole to help operators manage integrity better. Linking surface and downhole measurements means that Point can adapt to meet the simplest or most complex integrity challenges routinely and cost effectively.

Powered by ultrasound

Several techniques are capable of detecting integrity failures in a well. Proprietary ultrasound technology combined with complementary measurements, expert assessment, protocols and analysis positions the Point system in a class of its own.

Locate leaks and flowpaths behind tubing

Reliable diagnostic systems need to locate all types of barrier failure throughout the well system with minimal disruption. The Point system is designed to cater for all scenarios—and works through tubing. This means comprehensive integrity evaluation without pulling the completion—minimising interruption to operations and the total cost of diagnostics.

CheckPoint®
Investigate barrier leaks and flowpaths from surface

Benefits

- Mitigates integrity risk
- Surface-based deployment eliminates intervention risk and minimises cost
- Proactively confirms integrity or indicates nature and proximity of failure
- Enables confident decisions and better-targeted further diagnosis
- Tiered pricing linked to complexity minimises cost of diagnosis
- Evaluates sealing performance of well barriers and complements other integrity management procedures
- Independent validation of remediation treatment or P&A

Summary

- Investigates integrity status from surface
- Performed proactively, or in response to a loss of integrity
- Provides overview of integrity status and broad understanding of failures and proximity in the well
- Three options /A10, /A50 and /A70 according to complexity of investigation
- Mainly involves measurement and analysis of pressure and fluid dynamics in each annulus
- Point engineer or customer deploys high-precision digital pressure gauges and other equipment
- Well is investigated statically and dynamically according to CheckPoint program

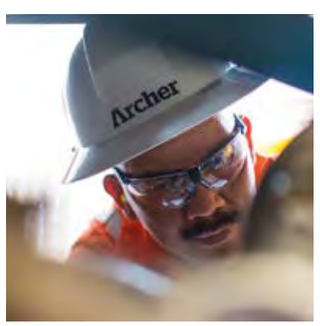
Many operators realise that proactive integrity management pays dividends. Continuous integrity monitoring, or conducting routine integrity checks, provides the reassurance that critical well barriers are intact or an early indication of failure, enabling timely action to be taken before the problem escalates.

We've created CheckPoint as the first stage in proactive well integrity appraisal. Deployed at surface, CheckPoint is used routinely, both to validate integrity and in response to a loss of integrity, to reveal detailed clues about the nature and location of the failure in the well. And because CheckPoint is performed at surface, it does not expose the operator to the disruption, cost and risk associated with logging interventions. Even better, CheckPoint programs are inherently straightforward, easy to mobilise, and low cost.

How it works

Barrier leaks and unwanted flowpaths can be signalled at surface by changes in well performance or by sustained annulus pressure [SAP]. CheckPoint protocols interrogate the pressure dynamics in selected annuli under varied well states, and this information, together with other well data, is used by our engineers and analysts to determine the integrity status of the well and characterise failures.

Following an initial client consultation and assessment of existing data, our analyst recommends one of three CheckPoint options for execution at the wellsite by the engineer. The analyst or engineer will evaluate their findings and advise if further diagnostics are required at surface, or downhole using LeakPoint, FlowPoint, or another diagnostic system, and design a tailored intervention program if needed.



CheckPoint®/A10

Investigate primary barrier leaks

A standard program to investigate straightforward integrity failures.

Proactive or when SAP is suspected or observed in the A-annulus.

Targets the primary barrier tubing and A-annulus.

Uses existing data or high-precision instruments to measure static and dynamic digital pressure profiles.

Engineer or analyst provides a brief report outlining integrity status, characterising SAP, with estimated inflow leak rate for the A-annulus.

CheckPoint®/A50

Investigate all barrier leaks and a single annular flowpath

A custom program to investigate complex integrity failures.

Proactive or when SAP is suspected or observed in a single cemented annulus.

Targets all barriers and a single cemented annulus.

Uses high-precision instruments to measure static and dynamic digital pressure profiles.

Senior analyst provides a comprehensive report detailing integrity status, characterising SAP, with calculated inflow leak rates for affected annuli.

CheckPoint®/A70

Investigate all barrier leaks and multiple annular flowpaths

A custom program to investigate highly complex, multiple failures.

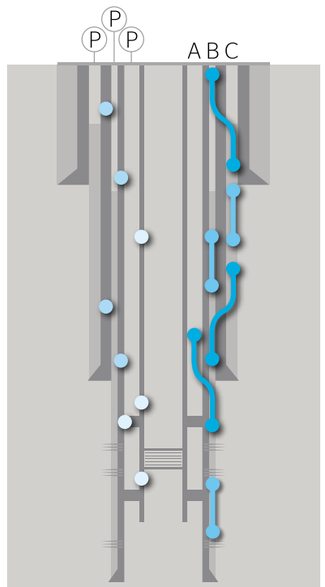
Proactive or when SAP is suspected or observed in multiple cemented annuli.

Targets all barriers and multiple cemented annuli.

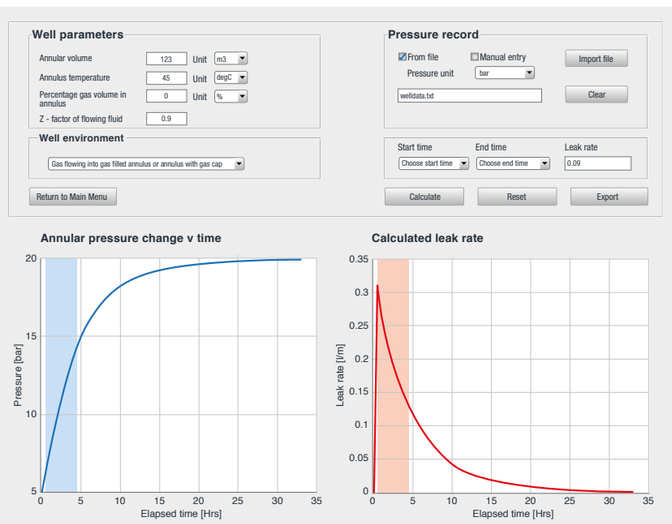
Uses high-precision instruments to measure static and dynamic digital pressure profiles.

Injectivity testing may be performed to reveal more complex failures.

Senior analyst provides an advanced report detailing the integrity status, characterising SAP, with calculated inflow leak rates for affected annuli.



CheckPoint is deployed proactively at surface to investigate barrier leaks and flowpaths.



The CheckPoint utility module converts digital pressure data to gross leak rates in a wide range of well conditions.

LeakPoint®
Locate barrier leaks downhole

Benefits

- Mitigates integrity risk
- Potentially saves wells from premature re-completion or abandonment
- Rapid, through-tubing deployment minimises disruption and cost
- Locates leaks rapidly, accurately, clearly and completely
- Enables confident decisions and better-targeted further diagnosis
- Tiered pricing linked to complexity minimises cost of diagnosis
- Evaluates sealing performance of well barriers and complements other integrity management procedures
- Independent validation of remediation treatment or P&A

Summary

- Locates barrier leaks downhole
- Performed in response to a loss of integrity
- Provides clear picture of integrity status and accurate location of leaks in the well
- Two options /A10 and /A30 according to complexity of failure
- Mainly involves measurement and analysis of ultrasound energy in the well
- Point engineer deploys LeakPoint logging platform
- Well is surveyed statically and dynamically according to LeakPoint program

Leaks can reduce a well's performance throughout its life and cause serious safety, environmental and reputational issues. With legacy leak-detection methods such as temperature or acoustic noise logs, the reliability of diagnosis varies as results can be affected by leak rate and location. Low-rate or multiple leaks and leaks beyond the primary tubular are particularly challenging.

LeakPoint is able to expose leaks in the primary tubular and surrounding casings or completion equipment clearly, reliably and consistently. Unlike conventional methods, LeakPoint detection technology is sensitive to a wide range of leak rates and locations. Results are vividly clear and unambiguous— leak locations are revealed with pinpoint accuracy. And more complex leaks beyond the A-annulus can also be diagnosed—even while a well is flowing.

How it works

Well fluids escaping through a typical leak generate ultrasound energy. LeakPoint engineers scan the well using proprietary ultrasound sensing technology to detect and locate these tell-tale signs. The resolution and precision of ultrasound, and the immunity of Point to "noise" from other parts of the well, means that leak signatures are often vividly clear, so leaks can be located effortlessly with pin-point accuracy— even at the wellsite.

LeakPoint surveys are deployed when a barrier leak is suspected, either as a result of a CheckPoint/A10 or /A50 investigation, or another indicator. Two survey types are available to locate simple primary barrier leaks or more complex secondary barrier leaks. LeakPoint provides the reliable data needed by operators to select with confidence the most effective remedial intervention to restore the integrity of the well.

LeakPoint®/A10

Locate primary barrier leaks

A standard survey to diagnose straightforward integrity failures.

Follows a CheckPoint/A10 investigation, or when SAP is observed in the A-annulus.

Targets primary barriers and A-annulus.

Uses a LeakPoint/A10 logging platform.

Engineer evaluates data to define the failures and their precise location.

Leak locations are normally clearly visible in wellsite field logs.

LeakPoint®/A30

Locate all barrier leaks

A standard survey to diagnose moderately complex integrity failures.

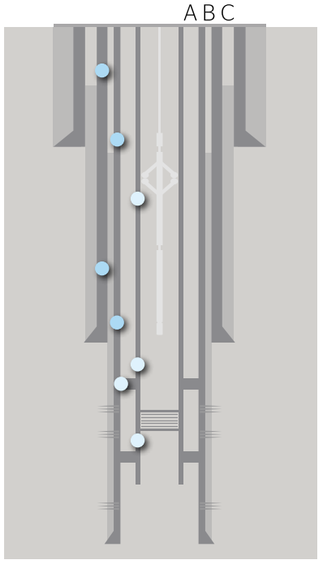
Follows a CheckPoint/A50 or /A70 investigation, or when SAP is observed in a single cemented annulus.

Targets each suspected barrier and annulus.

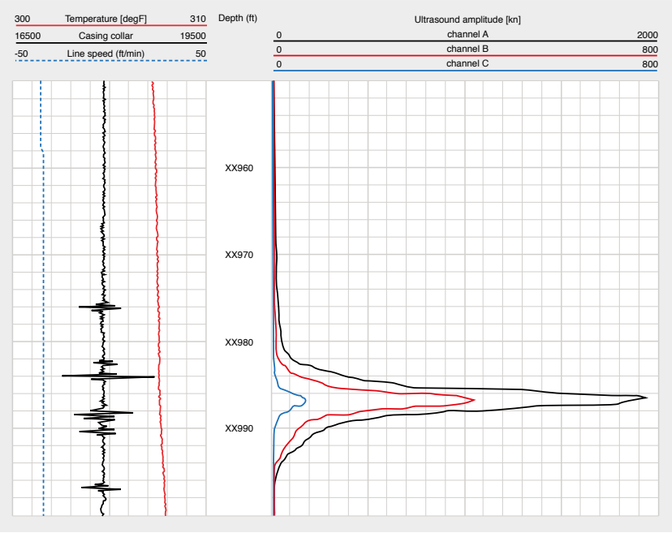
Uses a LeakPoint/A30 logging platform.

Analyst evaluates data to define the failures and their precise location.

Leak locations may be visible in field logs, or data may require further interpretation.



LeakPoint locates barrier leaks rapidly, accurately and completely, without pulling the completion string.



Precise and unambiguous: a LeakPoint field plot clearly exposes a packer leak, enabling confident and targeted remediation.

FlowPoint®
Locate barrier leaks and flowpaths downhole

Benefits

- Mitigates integrity risk
- Potentially saves wells from premature re-completion or abandonment
- Efficient, through-tubing deployment minimises disruption and cost
- Locates leaks and maps flowpaths efficiently, accurately, clearly and completely
- Enables confident decisions and better-targeted further diagnosis
- Tiered pricing linked to complexity minimises cost of diagnosis
- Evaluates sealing performance of well barriers and complements other integrity management procedures
- Independent validation of remediation treatment or P&A

Summary

- Locates barrier leaks and flowpaths downhole
- Performed in response to a loss of integrity
- Provides clear picture of integrity status and accurate location of leaks and flowpaths in the well
- Two options /A50 and /A70 according to complexity of failure
- Involves a detailed analysis of ultrasound energy, temperature and other well parameters
- Point engineer deploys FlowPoint logging platform
- Well is surveyed statically and dynamically according to FlowPoint program

Losing annular integrity is one of the most dangerous and potentially damaging types of well failure. Contaminated ground water and annular blowouts at surface are among the most feared potential outcomes. Despite advances in cementing, unwanted annular flow and sustained annulus pressure due to poor cement sealing is a prevailing concern for many operators. Diagnosing flow behind casing has challenged well engineers for decades, and the most commonly used annular diagnostic methods downhole only evaluate barrier condition — not barrier sealing performance.

Building on the capabilities of LeakPoint, FlowPoint can locate barrier leaks and map unwanted annular flowpaths throughout the well system, enabling it to diagnose the most complex multiple failure scenarios efficiently and comprehensively.

How it works

FlowPoint captures the ultrasound energy and temperature anomalies created by turbulent fluid flow through barrier leaks and annular flowpaths. From within the tubing, it can detect flow behind pipe with great accuracy — even through multiple casing strings. These sensitive downhole measurements are processed, modelled and then tied with surface observations, providing our analysts with the vital forensic evidence needed to decipher and describe the integrity dynamics of the well.

FlowPoint is typically deployed following a CheckPoint/A50 or /A70 investigation when abnormal annulus pressure is observed in one or more cemented annuli. Two survey types are available for either single or multiple flowpath scenarios. The rich and illuminating data delivered by FlowPoint can prove invaluable in resolving the most complex well-integrity issues, helping operators to protect people, the environment, and their assets.

FlowPoint®/A50

Locate all barrier leaks and a single annular flowpath

A custom survey to diagnose complex integrity failures.

Follows a CheckPoint/A50 or /A70 investigation, or when SAP is observed in a single cemented annulus.

Targets each suspected barrier and annulus.

Uses a FlowPoint/A50 logging platform and expert analysis.

Senior analyst evaluates data to define the failures and their precise location.

Following in-depth analysis and interpretation, a final report is typically delivered within 5 to 7 days.

FlowPoint®/A70

Locate all barrier leaks and multiple annular flowpaths

A custom survey to diagnose highly complex, multiple failures.

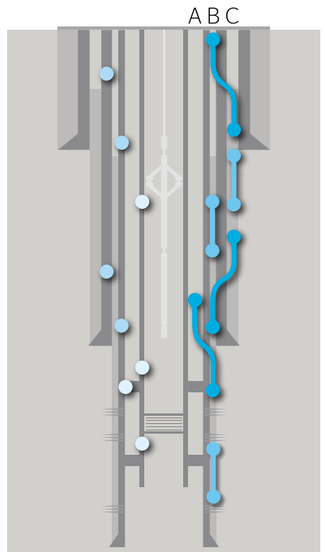
Follows a CheckPoint/A70 investigation, or when SAP is observed in multiple cemented annuli.

Targets each suspected barrier and annulus.

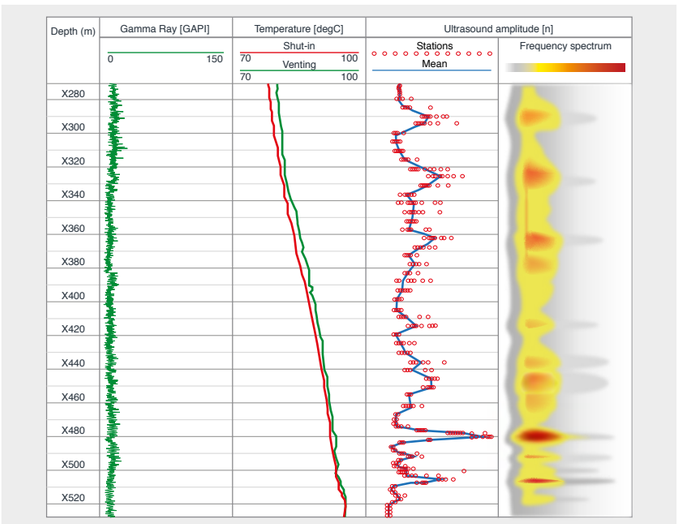
Uses a FlowPoint/A70 logging platform and expert analysis.

Senior analyst evaluates data to define the failures and their precise location.

Following in-depth analysis and advanced interpretation, a final report is typically delivered within 7 to 10 days.



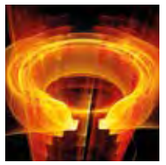
FlowPoint locates barrier leaks and annular flowpaths to diagnose the most complex failure scenarios.



FlowPoint's ultrasound and temperature responses reveal a single flowpath in the B-annulus between X520m and X300m.

Complete integrity toolbox
Assessing barrier condition and performance

The Point system is complemented by a fleet of technology and services that assess barrier condition and performance—enabling a complete and versatile approach that adapts to our customers' integrity management needs, whatever they might be.



Electromagnetic thickness
Archer uses the latest generation of electromagnetic pipe inspection technology—capable of screening up to three concentric pipes. And as with our caliper services, each electromagnetic survey is meticulously processed and interpreted by an expert pipe inspection analyst.

Multifinger caliper thickness
Archer caliper services are founded upon the expertise and dedication of our in-house analysts: their robust and diverse analysis techniques and powerful digital reporting, all backed up by our use of premium brand caliper instruments to acquire the most accurate data downhole.

Acoustic cement mapping
For a more traditional diagnosis of barrier condition, Archer provides acoustic radial bond cement mapping services using a proven and reliable logging platform. This service complements our other well barrier condition and performance surveys.

Optical 2D imaging
Archer's range of optical imaging systems harnesses the best available optics, digital image processing, and high bandwidth to deliver high-definition images to decision makers—wherever they are.

Ultrasound 3D imaging
Coming from the same stable as the Point system, SPACE is Archer's category-defining technology that uses ultrasound imaging to create high-definition, 3D visualisations of primary barriers, assemblies and their components in the wellbore—even in opaque production fluids.

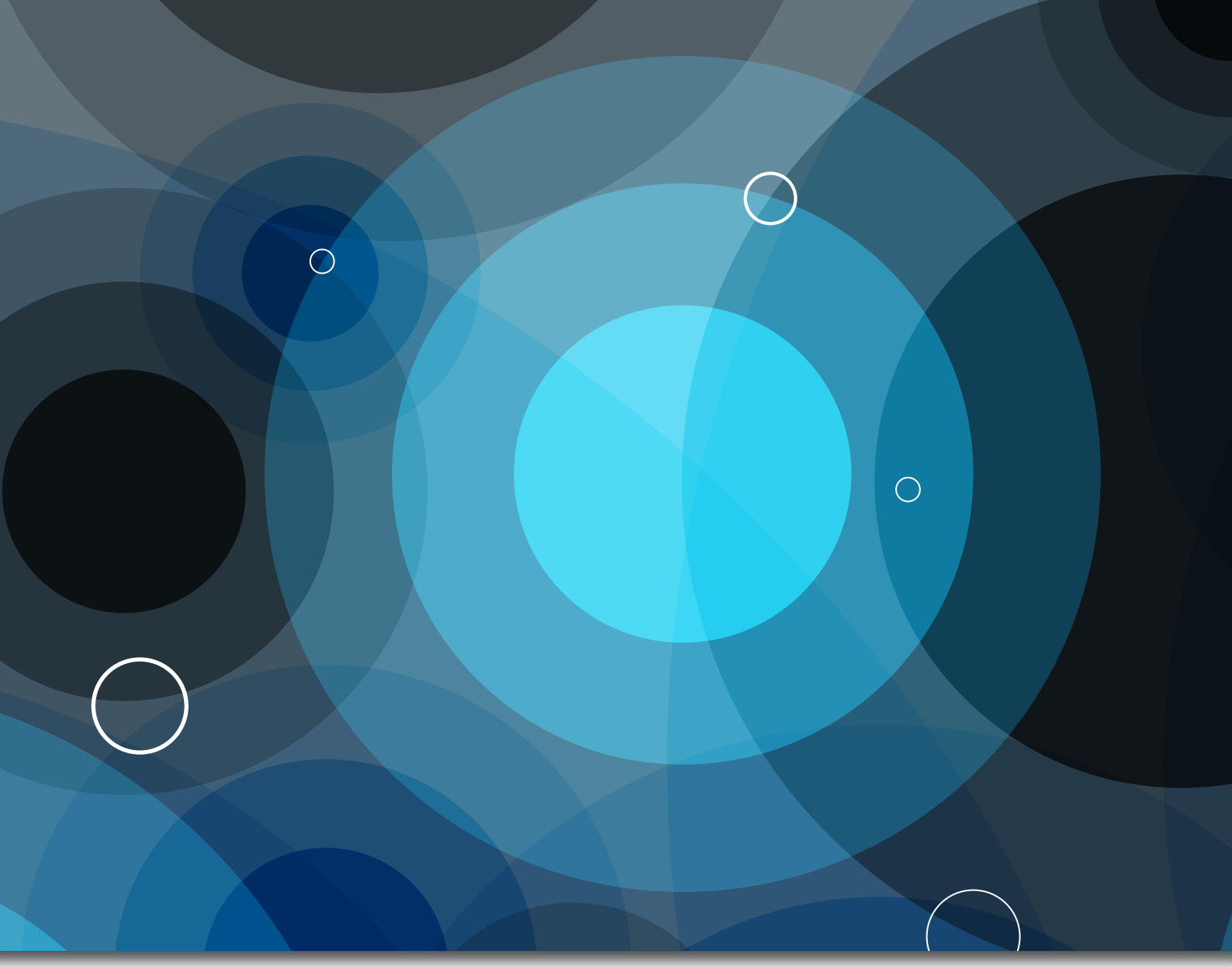
Ultrasound flow
Point's sensitive ultrasound receivers—with advanced digital signal processing, precision temperature sensors, proprietary detection algorithms and unique flow-modelling engine—enable our specialists to directly measure the sealing performance of well barriers.

Acoustic fibre flow
Archer's unique acoustic fibre system combines proprietary inversion and indexing techniques with a hybrid wireline deployment system to deliver continuous time-based detection of leaks and flowpaths downhole. Combine with Point for the ultimate in failure detection.

Summary

System dimensions	Surface			Downhole			
	Check**Point**/A10	Check**Point**/A50	Check**Point**/A70	Leak**Point**/A10	Leak**Point**/A30	Flow**Point**/A50	Flow**Point**/A70
Primary selection criteria							
SAP in A-annulus	●			●			
SAP in single cemented annulus		●			●	●	
SAP in multiple cemented annuli			●				●
Applications							
Primary barrier leaks	●	●	●	●	●	●	●
All barrier leaks		●	●		●	●	●
Single annular flowpath flowpath		●	●			●	●
Multiple annular flowpaths			●				●
Annular pressure evaluation	●	●	●	●	●	●	●
External casing seals [with PLT]					●	●	●
Flow perturbations [with PLT]						●	●
Zonal isolation, crossflow analysis						●	●
Quantitative flow mapping						●	●
Deliverables							
Field print				●	●	●	●
Standard report	●	●		●	●	●	
Advanced interpretation report		○	●		○	○	●
Quantitative flow analysis						○	○
Rapid response report	○	○	○	○	○	○	○
Sensors and measurements							
Surface digital pressure gauges	●	●	●	○	○	○	○
Annular liquid level		○	○				
Annular injectivity		○	○				
Surface leak flow rate		○	○				
S100 ultrasound sensors				●●	●	●●	●
S300 ultrasound sensors					●	●	●●
T100 temperature sensors				●	●	●	●○
P100 quartz pressure sensors				●	●	●	●
Casing collar locator				●	●	●	●
Accelerometer					●	●	●
Gamma ray				○	○	●	●
Production logging				○	○	○	○
Multifingered caliper				○	○	○	○
Cement evaluation				○	○	○	○
Acquisition and execution							
Surface readout	●	●	●	●	●		
Slickline				●	●	●	●
Downhole dynamic logging				●	●	●	●
Downhole station logging					●	●	●

○ = optional



Archer is a global oilfield service company with more than 40 years' experience, over 7,000 employees, and operations in more than 100 locations worldwide. From drilling services, production optimisation, well integrity and intervention to decommissioning, Archer focuses on safely delivering the highest quality services and products to the drilling and well service markets. **We are Archer.**

archerwell.com

Archer